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(21) International Application Number: PCT/US90/07169 (22) International Filing Date: 7 December 1990 (07.12.90) (30) Priority data: 452,998 19 December 1989 (19.12.89) US (71) Applicant: THE PROCTER & GAMBLE COMPANY [US/US]; One Procter & Gamble Plaza, Cincinnati, OH 45202 (US). (72) Inventors: YETTER, Jerry, Joseph ; 6174 Seiler Drive, Cincinnati, OH 45239 (US). BROADDUS, Charles, David ; 867 Carini Lane, Cincinnati, OH 45218 (US). (74) Agents: WITTE, Monte, D. et al.; The Procter & Gamble Company, Ivorydale Technical Ctr., 5299 Spring Grove Ave., Cincinnati, OH 45217-1087 (US).		(81) Designated States: AT (European patent), AU, BE (European patent), CA, CH (European patent), DE (European patent), DK (European patent), ES (European patent), FR (European patent), GB (European patent), GR (European patent), IT (European patent), JP, KR, LU (European patent), NL (European patent), SE (European patent). Published <i>With international search report.</i>
(54) Title: DISPOSABLE SANITARY GARMENTS (57) Abstract Disposable sanitary garments comprise topsheet and/or backsheet materials prepared from polymers based on glycolic acid, lactic acid, and mixtures thereof. Disposable sanitary articles having absorbent cores comprising oxidized cellulose are also provided. Diapers, sanitary napkins, pantliners, and the like, prepared from the foregoing materials are disclosed.		

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DISPOSABLE SANITARY GARMENTS

TECHNICAL FIELD

5 The present invention relates to disposable absorbent articles such as diapers, sanitary napkins, pantliners, and the like, which are especially adapted for absorbing various bodily fluids. The articles herein are prepared from topsheet and/or backsheet and/or absorbent core materials which are designed to enhance their disposability.

10 BACKGROUND OF THE INVENTION

A wide variety of absorbent structures designed to be efficient for the absorption of body fluids such as blood, urine, menses, and the like, are known. Disposable products of this type generally comprise some sort of fluid-permeable topsheet material, 15 an absorbent core, and a fluid-impermeable backsheet material.

Heretofore, such absorbent structures have been prepared using, for example, topsheet materials prepared from woven, nonwoven, or porous formed-film polyethylene or polypropylene materials. Backsheet materials typically comprise flexible 20 polyethylene sheets. Absorbent core materials typically comprise wood pulp fibers or wood pulp fibers in combination with absorbent gelling materials.

One aspect of such sanitary products which has recently been considered is their disposability. Although such products largely 25 comprise materials which would be expected ultimately to degrade, and although products of this type contribute only a very small percentage of the total solid waste materials generated by consumers each year, nevertheless, there is currently a perceived need to devise such disposable products from materials which 30 degrade relatively quickly, thereby lessening their bulk.

The practice of the present invention draws upon the well-known teachings of the surgical arts to meet the aforesaid disposability issue. In particular, those aspects of the surgical arts relating to sutures and hemostats are employed in the 35 practice of this invention to provide desirable topsheet, backsheet and absorbent core materials.

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5 More particularly, the present invention employs the types of materials used by surgeons in synthetic absorbable sutures to provide topsheet and backsheet materials which can be used to fashion diapers, sanitary napkins, pantliners, and the like. Such suture materials, especially those based on glycolic acid and/or lactic acid, as described hereinafter, are designed to degrade by simple hydrolysis, e.g., in landfills. The oxidized celluloses employed as absorbent cores herein are also well-known from surgical arts as absorbent hemostatic materials. Such materials are also broken down by natural biological processes, thereby enhancing their disposability.

10 In short, the present invention uses conventional knowledge from the medical arts relating to absorbable, hydrolyzable and biodegradable surgical materials, and reapplies such materials in an unconventional way to prepare disposable sanitary products for use by the consumer.

BACKGROUND ART

20 The present invention relates to the preparation of diapers, sanitary napkins, pantliners, and the like, all of which have been described in great detail in patents and other literature. A wide variety of such articles are commercially available. It is to be understood that this invention does not relate to the manufacture of any particular type, shape or style of such articles; rather, the invention herein relates to the particular choice of topsheet, backsheet and core materials which can be used in the manufacture of such articles to make them more disposable.

25 The preparation of surgical sutures from degradable polymers is described in REMINGTON'S PHARMACEUTICAL SCIENCES 15th Edition (1975) p. 1778, Mack Publishing Company, Easton, PA.

30 The preparation of oxidized cellulose for use as absorbable surgical hemostats is described *ibid.*, p. 1775.

35 The journal NEW SCIENTIST, November 25, 1989, p. 37, mentions the use of polymers made from lactic acid as being useful as biodegradable plastics. The use of such polymers in dissolving sutures and bags is mentioned.

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SUMMARY OF THE INVENTION

5 The present invention encompasses disposable absorbent structures, comprising a water-permeable topsheet, an absorbent core, and a water-impermeable backsheet, said structures being characterized in that said backsheet comprises a flexible film comprising a lactic acid-based or glycolic acid-based polyester. Said polyester backsheet can also comprise a co-polyester based on glycolic acid and lactic acid.

10 The invention also encompasses disposable absorbent structures, comprising said water-permeable topsheet, absorbent core and water-impermeable backsheet, said structures being characterized in that said topsheet comprises a flexible porous sheet or woven or nonwoven web of polymer comprising a lactic acid-based or glycolic acid-based polyester. Again, the polyester
15 topsheet can also comprise a co-polyester based on lactic acid and glycolic acid. Such topsheets are preferably in the form of a nonwoven web.

20 In another aspect, the invention encompasses disposable absorbent structures comprising a water-permeable topsheet, a water-impermeable backsheet, and an absorbent core, said structures being characterized in that said absorbent core comprises oxidized cellulose. Typically, the oxidized cellulose comprises at least 16% carboxyl groups.

25 Other structures according to this invention are those wherein both the topsheet and the backsheet comprise a lactic acid-based or glycolic acid-based polyester, or co-polyester thereof. Still other structures have both topsheet and backsheet prepared from the foregoing polyesters, and also have oxidized cellulose comprising the absorbent core. The oxidized cellulose
30 absorbent core can also contain an absorbent gelling material to provide additional absorbent capacity.

Structures according to any of the foregoing embodiments of the invention are provided in the form of disposable diapers,
35 sanitary napkins or pantliners.

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All ratios, proportions and percentages herein are by weight, unless otherwise specified.

DETAILED DESCRIPTION

5 The polyesters employed to prepare the topsheet and backsheet materials employed herein are based on glycolic acid (HOCH_2COOH),
lactic acid ($\text{CH}_3\text{CHOHCOOH}$) and mixtures thereof. Glycolic acid is
available commercially from the oxidation of ethylene glycol with
dilute acid; by the hydrolysis of chloroacetic acid; or by the
10 reaction of formaldehyde with carbon monoxide. Lactic acid is
available from various fermentation processes, using any
convenient lactose source. As is known from the literature, these
acids can be reacted using well-known reaction conditions to form
polyester polymers. In a typical reaction, the cyclic derivative
15 of glycolic acid (glycolide) and/or the cyclic derivative of
lactic acid (lactide), or mixtures thereof (i.e., to form
"co-polyesters"), are polymerized. Typically, molecular weights
range from several hundred thousand to several million.

For use as topsheet materials, the foregoing glycolic
20 acid-based or lactic acid-based polyesters can be cast as sheets
having a multiplicity of perforations therethrough, or can be used
in the form of filaments to prepare a woven or nonwoven web. The
formation of perforated sheets and webs for use as topsheets is
well-known in the art. The same manufacturing principles apply
25 when such sheet or webs are made using the polyesters herein.

For use as backsheet materials, the aforesaid polyesters are
simply cast into nonperforate, flexible sheets (typically 0.01 mm
to 2 mm thickness).

It is to be understood that the articles herein can comprise
30 either the topsheet, the backsheet, or both, made from the
aforementioned polyester polymers.

The oxidized cellulose absorbent material can be prepared by
the mild oxidation of any convenient source of cellulose, e.g.,
wood pulp, cotton, and the like. Oxidized cotton is available
35 from Parke-Davis in the form of gauze, strips and pads.

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Typically, the oxidized cellulose contains at least 16% (generally 16-24%) carboxyl groups.

5 It is to be understood that the articles herein can be prepared using either oxidized cellulose or ordinary cellulose fibers as the absorbent core. Moreover, said cores can also contain additional absorbent materials, especially the high fluid capacity absorbent gelling materials commonly used in modern
10 diapers and sanitary napkins. Such materials include, for example, acrylates, starch grafted alkylates, and various gums and/or saccharidic gelling materials which absorb and hold 10-50 times their weight of water. Such materials are thoroughly described in the voluminous patent literature relating to disposable sanitary products, and are available from various commercial sources.

15 The following Examples illustrate the practice of this invention.

EXAMPLE I

A disposable baby diaper according to this invention is prepared as follows. The dimensions listed are for a diaper
20 intended for use with a child in the 6-10 kilogram size range. These dimensions can be modified proportionately for different size children, or for adult incontinence briefs, according to standard practice.

25 1. Backsheet: 0.025-0.070 mm polyglycolate film; width at top and bottom 33 cm; notched inwardly on both sides to a width-at-center of 28.5 cm; length 50.2 cm.

30 2. Topsheet: nonwoven fabric scrim comprising lactate/glycolate co-polyester fibers; width at top and bottom 33 cm; notched inwardly on both sides to a width-at-center of 28.5 cm; length 50.2 cm.

35 3. Absorbent core: oxidized cellulose (16-24% carboxyl); 8.4 mm thick, calendered; width at top and bottom 28.6 cm; notched inwardly at both sides to a width-at-center of 10.2 cm; length 44.5 cm.

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4. Elastic leg bands: four individual rubber strips (2 per side); width 4.77 mm; length 370 mm; thickness 0.178 mm (all the foregoing dimensions being in the relaxed state).

5 The diaper of Example I is prepared in standard fashion by positioning the core material covered with the topsheet on the backsheet and gluing.

10 The elastic bands (designated "inner" and "outer", corresponding to the bands closest to, and farthest from, the core, respectively) are stretched to ca. 50.2 cm and positioned between the topsheet/backsheet along each longitudinal side (2 bands per side) of the core. The inner bands along each side are positioned ca. 55 mm from the narrowest width of the core (measured from the inner edge of the elastic band). This provides
15 a spacing element along each side of the diaper comprising the flexible topsheet/backsheet material between the inner elastic and the curved edge of the core. The inner bands are glued down along their length in the stretched state. The outer bands are positioned ca. 13 mm from the inner bands, and are glued down along their length in the stretched state. The topsheet/backsheet
20 assembly is flexible, and the glued-down bands contract to elasticize the sides of the diaper.

EXAMPLE II

25 A lightweight pantiliner suitable for use between menstrual periods comprises a pad (surface area 117 cm²; SSK air felt 3.0 g) containing 1.0 g of absorbent gelling material particles (commercial polyacrylate; Nippon Shokubai); said pad being interposed between a porous formed-film topsheet according to U.S. Patent 4,463,045 and a backsheet which comprises a 0.03 mm
30 thickness polyglycolate film.

EXAMPLE III

35 A catamenial product in the form of a sanitary napkin having two flaps extending outward from its absorbent core is prepared using a pad in the manner of Example II (surface area 117 cm²; 8.5 g SSK air felt), per the design of U.S. Patent 4,687,478, Van Tillburg, August 18, 1987. The backsheet comprises 0.025 mm

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polyethylene, and the topsheet comprises a nonwoven scrim of polylactate fibers.

EXAMPLE IV

5 The sanitary napkin of Example III is modified by replacing the topsheet with a porous nonglossy formed film, per U.S. Patent 4,687,478, said film being prepared from a lactate/glycolate co-polyester.

10 It will be appreciated that the polyester materials herein can, if desired, be physically modified by means of various plasticizer materials, in well-known fashion. Likewise, various polyols and/or compounds containing carboxyl/hydroxyl moieties can be included in the polymerization mixture to modify the polymer properties, according to the desires of the formulator. So long
15 as the lactic acid-derived and/or glycolic acid-derived portion of the polymer remains at least 35% (mole basis), preferably 50% (mole basis) of the resulting polymer, the desired benefits of this invention can be achieved.

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WHAT IS CLAIMED IS:

1. A disposable absorbent structure, comprising a water-permeable topsheet, an absorbent core, and a water-impermeable backsheet, said structure being characterized in that said backsheet comprises a flexible film comprising a lactic acid-based or glycolic acid-based polyester.
5
2. A structure according to Claim 1 wherein the polyester backsheet comprises a co-polyester based on glycolic acid and lactic acid.
3. A disposable absorbent structure, comprising a water-permeable topsheet, an absorbent core and a water-impermeable backsheet, said structure being characterized in that said topsheet comprises a flexible porous sheet or woven or nonwoven
5 web of polymer comprising a lactic acid-based or glycolic acid-based polyester.
4. A structure according to Claim 3 wherein the polyester topsheet comprises a co-polyester based on lactic acid and glycolic acid.
5. A structure according to Claim 3 wherein the topsheet is in the form of a nonwoven web.
6. A disposable absorbent structure comprising a water-permeable topsheet, a water-impermeable backsheet, and an absorbent core, said structure being characterized in that said absorbent core comprises oxidized cellulose.
7. A structure according to Claim 6 wherein the oxidized cellulose comprises at least 16% carboxyl groups.

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8. A structure according to Claim 1 wherein both the topsheet and the backsheet comprise a lactic acid-based or glycolic acid-based polyester, or co-polyester thereof.
9. A structure according to Claim 8 wherein the absorbent core comprises oxidized cellulose.
10. A structure according to Claim 1, in the form of a disposable diaper, sanitary napkin or pantiliner.
11. A structure according to Claim 3 in the form of a disposable diaper, sanitary napkin or pantiliner.
12. A structure according to Claim 6 in the form of a disposable diaper, sanitary napkin or pantiliner.
13. A structure according to Claim 8 in the form of a disposable diaper, sanitary napkin or pantiliner.
14. A structure according to Claim 9 in the form of a disposable diaper, sanitary napkin or pantiliner.
15. A structure according to Claim 6 wherein the oxidized cellulose absorbent core additionally contains an absorbent gelling material.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US90/07169

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ¹ According to International Patent Classification (IPC) or to both National Classification and IPC IPC(5): A61F 13/15 US CL.: 604/376											
II. FIELDS SEARCHED <div style="text-align: center; margin-top: 10px;">Minimum Documentation Searched ⁴</div> <table style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 30%; text-align: left; border-bottom: 1px solid black;">Classification System</th> <th style="width: 70%; text-align: left; border-bottom: 1px solid black;">Classification Symbols</th> </tr> <tr> <td style="padding: 5px;">US</td> <td style="padding: 5px;">128/156 606/213, 230, 231, 77 604/358, 364, 374, 375, 376, 367, 368, 891.1</td> </tr> </table> <div style="text-align: center; margin-top: 10px;">Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁵</div>			Classification System	Classification Symbols	US	128/156 606/213, 230, 231, 77 604/358, 364, 374, 375, 376, 367, 368, 891.1					
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US	128/156 606/213, 230, 231, 77 604/358, 364, 374, 375, 376, 367, 368, 891.1										
III. DOCUMENTS CONSIDERED TO BE RELEVANT ¹¹ <table style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 10%; text-align: left; border-bottom: 1px solid black;">Category ⁶</th> <th style="width: 60%; text-align: left; border-bottom: 1px solid black;">Citation of Document, ¹⁰ with indication, where appropriate, of the relevant passages ¹²</th> <th style="width: 30%; text-align: left; border-bottom: 1px solid black;">Relevant to Claim No. ¹³</th> </tr> <tr> <td style="vertical-align: top; padding: 5px;">Y</td> <td style="padding: 5px;">US, A, 3,595,235 (JESPERSEN) 27 July 1971 See entire document.</td> <td style="vertical-align: top; padding: 5px;">1-15</td> </tr> <tr> <td style="vertical-align: top; padding: 5px;"><u>X</u> <u>Y</u></td> <td style="padding: 5px;">US, A, 4,685,909 (BERG et al.) 11 August 1987 See col. 3, lines 52-58; col. 5, lines 1-8, col. 8, lines 42-47 and col. 10, lines 32-34.</td> <td style="vertical-align: top; padding: 5px;"><u>6,12,15</u> 7</td> </tr> </table>			Category ⁶	Citation of Document, ¹⁰ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³	Y	US, A, 3,595,235 (JESPERSEN) 27 July 1971 See entire document.	1-15	<u>X</u> <u>Y</u>	US, A, 4,685,909 (BERG et al.) 11 August 1987 See col. 3, lines 52-58; col. 5, lines 1-8, col. 8, lines 42-47 and col. 10, lines 32-34.	<u>6,12,15</u> 7
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<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>[*] Special categories of cited documents: ¹⁴</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 45%;"> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"&" document member of the same patent family</p> </div> </div>											
IV. CERTIFICATION <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; vertical-align: top; padding: 5px;"> Date of the Actual Completion of the International Search ² 13 FEBRUARY 1991 International Searching Authority ¹ ISA/US </td> <td style="width: 50%; vertical-align: top; padding: 5px;"> Date of Mailing of this International Search Report ³ <div style="text-align: center; font-size: 1.2em; font-weight: bold;">11 APR 1991</div> Signature of Authorized Officer ¹⁰ <div style="text-align: center;"> RANDY SHAY </div> </td> </tr> </table>			Date of the Actual Completion of the International Search ² 13 FEBRUARY 1991 International Searching Authority ¹ ISA/US	Date of Mailing of this International Search Report ³ <div style="text-align: center; font-size: 1.2em; font-weight: bold;">11 APR 1991</div> Signature of Authorized Officer ¹⁰ <div style="text-align: center;"> RANDY SHAY </div>							
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